

lights certainly came from the direction of either cusp, and nearly touched. This phenomenon lasted but a very few seconds."

Some gentlemen, who threw the image of the sun upon a screen through their telescopes and theodolite-glasses, say they saw the line well defined all round upon the paper. The light, on the contrary, which Mr. Clarke saw, was in rapid projection, quickly disappeared, and was quite *white*; whilst the sun's light in the telescope was that of the *green* screen.

Mr. Clarke's observations of the eclipse have convinced him that, if the moon have any atmosphere, it is of extreme rarity; but, by observations of the eclipses of several spots, he is induced to think that there is *some* atmosphere, however rare.

An Account of placing Meridian Marks for the Stonyhurst Transit Circle. By the Rev. A. Weld, F.R.A.S.

"As the observatory of Stonyhurst possesses the advantage of a well-defined and unobstructed horizon, both in the northern and southern direction, it had long been my wish to fix marks exactly on the north and south points, with which I might compare the position of the transit circle, and so be aware, at sight, of any change that might take place in the bearings of the instrument. I believe the existence of a good meridian mark is always looked upon as an advantageous circumstance in the equipment of an observatory; and since on our horizon there was no object sufficiently defined, and near enough to the meridian, to answer that purpose well, I thought it worth while, to remedy that defect, to determine the exact north and south points of the meridian passing through our transit circle, and to fix marks there which should be easily seen with the ordinary observing power of the telescope.

"I must first state that the north and south points in our horizon are between four and five miles distant from the observatory, the northern being about 500, and the southern 300 feet above our level.

"The first object to be gained was to find the south point approximately, so as to confine our operations within the field of the telescope. This was effected in the following manner:—Two high poles were erected approximately in the meridian line; on the top of one an English, and on the other a French flag was hoisted. The object of these was to guide the exploring party into the right direction: this was known by the flags appearing in the same line. An observer accustomed to the use of telescopes was stationed in the observatory, with an assistant at each flag-post to work the signals, and two others to convey the requisite messages; whilst I went myself, with two or three others, to the hills, provided with a hand-telescope, a small flag, and a staff about eight feet long.

"It was arranged, before starting, that both flags should fly until we appeared on the horizon within the field of the telescope of the transit circle.

"The falling of one of the flags was the signal that we had been thus seen, and were therefore within a short distance of the

point of which we were in search. It was further arranged that as long as we were a little too much to the west the English flag alone should fly; and, on the other hand, the French flag was the signal that we were a little east of the meridian, though visible within the field of the transit.

"The first expedition was made on March 6th, and we succeeded very well in fixing the point approximately. We wandered some time on the hills before our little flag was descried from the observatory; but at length the falling of the French flag satisfied us that we were seen and understood, and the rapid change of the flags as we passed and repassed the meridian convinced us that active and prompt co-operation was afforded us from the observatory. The staff that had carried our flag was driven in, to serve as a mark, until a firmer and more permanent one could be obtained.

"This staff, which was about one inch and a quarter in thickness, was seen distinctly from the observatory (when the day was clear), as a line considerably finer than the spider-lines of the telescope.

"I now determined to remove the angle of collimation of the middle wire of the telescope, so as to make it coincide with the same point on the horizon in both positions of the axes of the instrument. This was done to my entire satisfaction; and I found that whether the illumined axis was east or west, and whether the telescope was turned to the north or south horizon, the middle wire agreed sensibly with the same distant points. This wire, however, does not coincide exactly with the mean of the system of five wires, but the interval between it and the mean has been carefully determined from twenty-six entire transits of *Polaris*, above and below the pole.

"I endeavoured also to reduce, as far as possible, the error of azimuth, in order, once for all, to fix the exact point where our meridian cuts the horizon. At the same time no opportunity was lost of carrying out the operations on the hill.

"It will readily be imagined that the distance, added to the uncertainty of the weather in a hilly country, must have occasioned many failures and consequent disappointments.

"On April 3d, the day being clear, I made a successful attempt. A heavy post of oak was procured, about nine feet in length and eight inches in thickness; this was surmounted by a cross consisting of two bars of iron, each two feet in length and two inches in breadth, hammered together in the middle, and driven by means of two strong spikes into the top of the post. The usual signals were used, with the additional understanding that both flags should fall promptly when the post was so placed that the cross of the bars was bisected by the middle wire of the transit. The signals were seen without difficulty; but I afterwards found from Mr. Vaughan, who superintended in the observatory, that the atmosphere was so unsteady that nothing could be determined with accuracy.

"No convenient opportunity offered itself for another expedition till April 26th, when I dug up the post, and succeeded in

planting it, I believe, with great accuracy in the meridian. On returning home I found the $\times$ intersected by the middle wire, but it did not appear to be perfectly bisected by it; the atmosphere was, however, rather disturbed at the time.

"A day or two after, the $\times$ appeared to me to be perfectly bisected by the middle wire; and as I have reason to believe the instrument was at that time very nearly in the meridian, I considered the position of the south point sufficiently determined.

"From observations on April 25th, on α *Urs. Maj.* and δ *Hyd. et Crat.*, I calculated the azimuthal error to be $+0''.12$; and on April 29th the mean of the two results obtained from β^1 *Scorpii* and ξ *Urs. Min.* with illumined axis east, and α *Ophiuchi* and ϵ *Urs. Min.* with illumined axis west, was $-0''.36$.

"So small an arc as either of these, when measured along the horizon, being quite an invisible quantity with the ordinary power of the telescope, I thought there was no use in trying to bring the instrument any nearer to the meridian.

"The only point of interest that remained was to measure the interval along the horizon which corresponded to the interval between two wires, that, knowing the space corresponding to a given arc, I might form an idea of the accuracy of the results which the meridian mark will afford, at the same time that I could calculate the distance from it to the observatory.

"The interval between two of the wires, measured on the ground, was 39 feet, and the equatoreal interval for the same wires $= 24^s.34 = 6' 11''.10$. This gives 4.13 miles as the distance of the mark from the observatory.

"The northern point was found in the same manner as the south, by expeditions made on April 21st, May 1st, 8th, and 22d, and is marked by a heavy larch-pole, 14 feet in length, and sunk 4 feet deep into the ground. On the top is a cross similar to that used in the south, with this difference, that the bars are 3 feet instead of 2 in length. The distance between two wires, measured along the north horizon, was 45.3 feet, which gives 4.8 miles as the distance from the observatory."

1851, April 10, Mr. Weld observed the occultation of a small star by the dark limb of the moon, at $12^h 36^m 59^s.7$ Stonyhurst sidereal time. H.C. 18007.

On some Improvements in Reflecting Instruments.

By Prof. Piazzì Smyth.

In the course of his lectures on Practical Astronomy to the students of the Edinburgh University last winter, Prof. P. Smyth had unusual opportunity of ascertaining those points in the making of the generality of the observations of navigators by sea and of travellers on land, which presented the greatest difficulty to beginners. And as these points generally consisted of needless peculiarities, sometimes absolute imperfections in the instruments, the Professor proceeded to remove them as well as he could, and